PAM & SAM System User's Manual

Part 4: PAM Technical Information

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This version replaces all previous versions of this document. It also replaces the SAM System Designer's Guide (1995-1996). Inmotion Technologies and ACC Motion have made every effort to insure this document is complete and accurate at the time of printing. In accordance with our policy of continuing product improvement, all data in this document is subject to change or correction without prior notice.

ACC Motion SA
Zone industrielle La Rippe
CH-1303 Penthaz
Switzerland

P/n 9032 011 984
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Introduction

Overview

The PAM (Programmable Axis Manager) is the control and motion coordination center in a PAM with SAM system. PAM controls motion, I/O and program flow as dictated by the application program under execution. Its advanced hardware and software technology make it especially well suited for applications where the motions of multiple axes must be precisely controlled and continuously coordinated with other machine functions.

Configurations

PAM is supplied in three different configurations:

- panel-mount chassis (PAM Full Systems), with i.e. Profibus-DP interface
- circuit board for direct installation in a PC (PAM-ISA)
- module for insertion into a Simatic S5 PLC

All PAM configurations provide the same core functionality and an identical EasyBus interface to the SAM Drives.

Functional Description

Main Board

(All PAM types; exceptions are stated)

CPU and Memory

The PAM hardware configuration (see Figure 1) is built around a 32-bit RISC processor (Intel i960) which performs all PAM functions.

The application program, and PAM firmware, along with data, reside in DRAM (Dynamic RAM) during application execution. PAM firmware and application programs are stored (compressed) in flash EEPROM.

Parameters are stored in non-volatile SRAM (Static RAM). A replaceable battery with a 7-year lifetime maintains the SRAM.

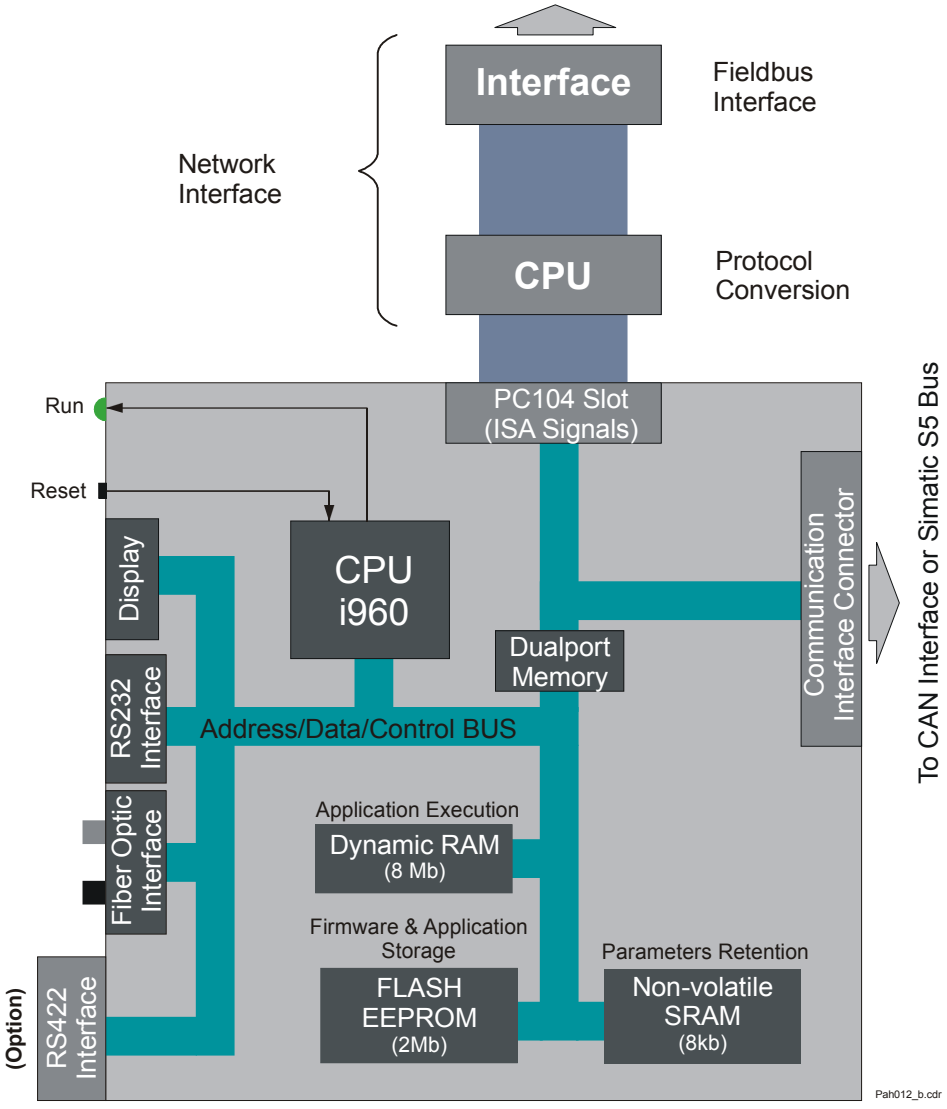

Figure 1 PAM Functional Block Diagram

Dualport Memory

A 4 Kbytes by 16 bit dual-port memory serves as the focal point for exchange of data and control information between a PAM with SAM system and a host PC/PLC. Access to the dual-port memory is via the 16 bit ISA Bus/PC104 connector or a back-plane connector.

Fiber Optic Bus Interface

The PAM includes a fiber optic bus interface and two fiber optic connectors for connecting to the EasyBus (fiber optic ring). All PAM models for use in PAM with SAM systems are supplied with plastic fiber optic connectors.

The fiber optic bus interface hardware includes a built-in test feature, which automatically performs a self-test of the complete EasyBus throughout the entire PAM with SAM system. PAM firmware sends a series of test messages around the fiber optic bus ring at reduced power level (80% of normal). Any loose connections, defective cable segments or other defect that may cause marginal operation of the Easy Bus are detected prior to starting application execution.

Operator Display and Controls

When using PAM-ISA, the information below is not relevant. Refer instead to “PAM-ISA Features, page 10.

On PAM Full Systems and PAM for Simatic S5, an 8 digit alphanumeric display (see Figure 2) provides a simple operator interface for diagnostic and maintenance purposes. A **RESET** button provides hardware-reset capability and a **RUN** indicator illuminates when the firmware is executing normally.

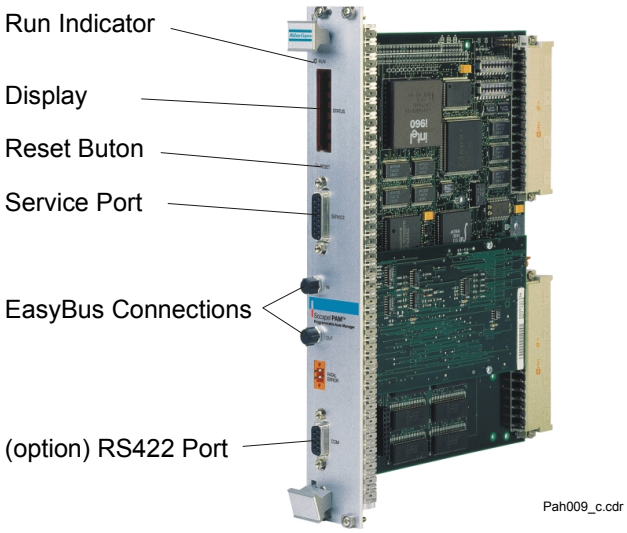

Figure 2 PAM Front Panel Controls, Indicators and Connectors

RS 232 interface

The RS 232 interface is a service port reserved for use with PAM Tools.

File Transfer Functions

Downloading Information during System Startup

During the system setup/configuration phase, application software, firmware and parameter files destined for the PAM or a SAM Drive may be downloaded to the PAM with SAM system through the Network Interface. Files destined for SAM drives are then routed to the specified SAM(s) over the fiber optic bus (Easy Bus).

The following file types may be downloaded to a PAM or SAM drive through the Network Interface:

- PAM - bootware, firmware, applications
- SAM - bootware, firmware, parameters, applications

Uploading Information during System Startup

At startup the host may request a PAM with SAM system configuration report which is uploaded to the host via the Host Communications Interface. This report includes information about the PAM with SAM system hardware and software configuration including PAM and SAM firmware versions, application program version, parameters version and other items. The host typically utilizes this report to detect changes in system configuration resulting from maintenance actions.

Communications during Application Execution

During application execution, the host controls a PAM with SAM system mainly by manipulating the value of selected PAM with SAM variables. New variable values are transmitted over the fieldbus in messages to the PAM. The PAM operating system immediately distributes the variables to the appropriate task(s).

Similarly, The PAM operating system sends the current value of requested variables to the host embedded in messages. An application program may also define “event driven” variables, which automatically generate messages to the host containing the variable's new value when the variable changes.

PAM Full System Features

PAM-F05 Full System - Profibus-DP

PAM's Network Interface (see Figure 3) is the point of information exchange between a PAM with SAM system and a Profibus-DP network. A software driver (running on a PC 104 CPU module) performs signal and message protocol conversion between Profibus-DP and PAM protocol.

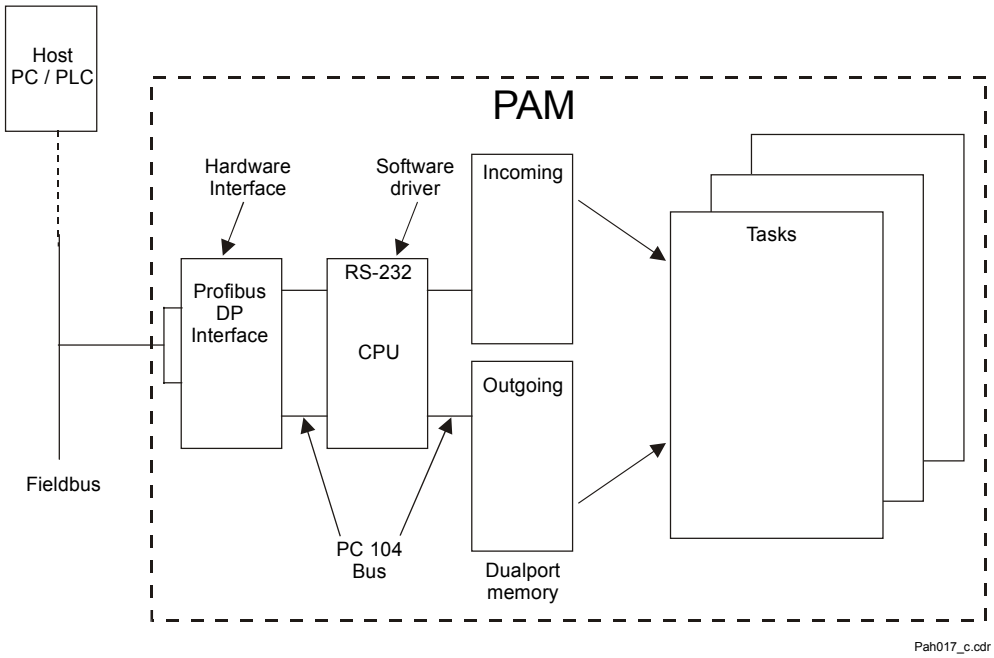

Figure 3 Profibus-DP Interface Block Diagram

PAM-F17 Full System - CAN interface

An optional CAN port is for communications with a host PC/PLC.

PAM-F26 Full System - RS 422 interface

An optional RS 422 port is for communications with a host PC/PLC.

PAM-ISA Features

Block Diagram

Figure 4 shows a block diagram of the PAM-ISA board. PAM-ISA utilizes the same CPU and memory configuration as the PAM module as well as an RS-232 interface and fiber optic interface, which perform the same functions as for the PAM.

Commands and data between the host PC and PAM-ISA are exchanged over a 16-bit ISA bus.

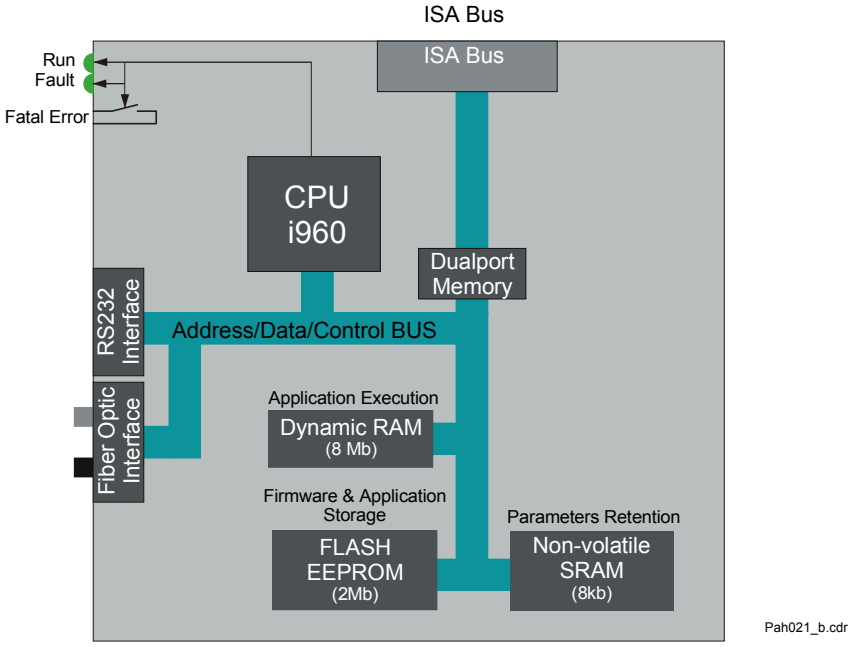

Figure 4 PAM-ISA Block Diagram

Status Indicators

The PAM-ISA has two LED status indicators (see Figure 5), a **Run** indicator (green) and a **Fault** indicator (red). The Run indicator indicates the PAM-ISA operating state (running normally, booting or off). The Fault indicator illuminates in the event of a CPU, memory or bootware error.

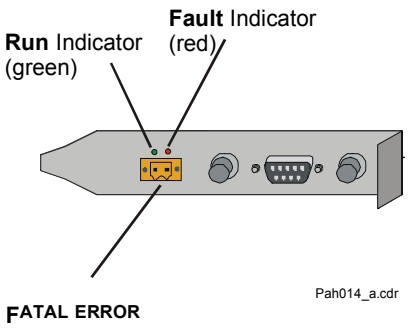

Figure 5 PAM-ISA Status Indicators

Fatal Error Output

The **FATAL ERROR** output is an isolated, normally open relay contact. The **FATAL ERROR** output is closed when no fatal error condition exists.

For additional information of the PAM-ISA, refer to the "PAM-ISA Technical Manual" (document 006.8037).

PAM for Simatic S5

Refer to PAM Simatic S5, Technical Manual (document 006.8006.B).

Specifications

PAM module (PAM Full Systems, PAM for Simatic S5)

Electrical and Environmental Specifications

CPU		
model		Intel i960 with floating point unit
clock speed	MHz	25
Onboard Memory		
DRAM (for application execution)	Mbytes	8
Flash EPROM (for firmware & application storage)	Mbytes	2
non-volatile RAM (for parameter retention)	Kbytes	8
PC 104 Bus		
specification version		2.1
memory operations		8 & 16 bit read/write operations
base address		switch selectable
RS 422 Port (optional)		
baud rate (basic cycle dependent)	Baud	9600 or 19,200
RS 232 Service Port		
baud rate	Baud	19,200
Input Power		
supply voltage	VDC	5.0 +/- 5 %
current	ADC	2.5 typ, 4.0 max
Ambient Temperature		
operating	°C.	5 - 45
transport and storage	°C.	- 25 to + 70

Table 1 PAM Module specifications (PAM Full Systems and PAM for Simatic)

PAM Rack (PAM Full Systems)

Chassis Electrical Specifications

24 VDC Supply	
Input Voltage	18 to 36 VDC
Built-in Supply Fuse	T6.3A, 250VAC
Hold-up time	20 ms
Overvoltage protection	yes, switches off power to the PAM module
Reverse input polarity protection	yes

Table 2 PAM Rack Specifications

Dimensions

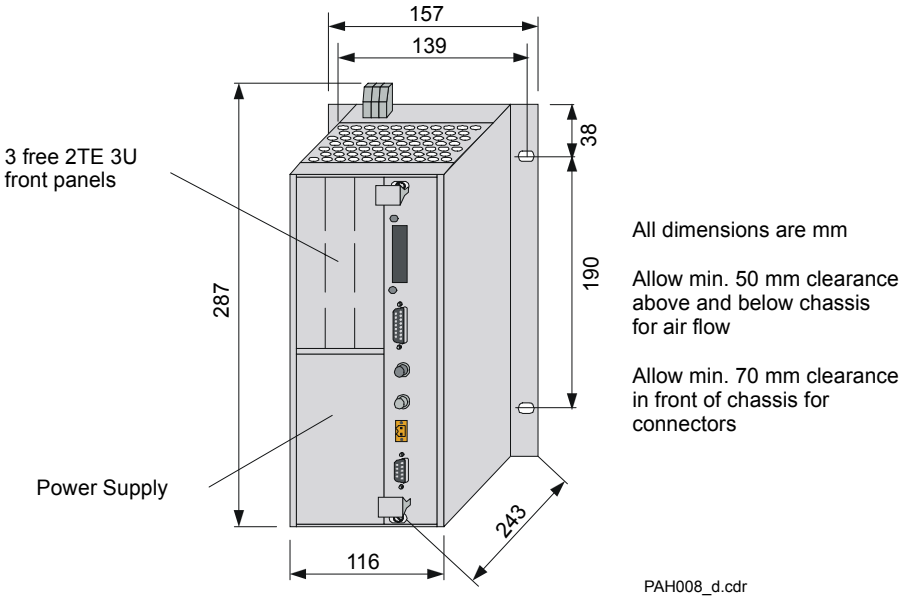

Figure 6 PAM Panel Mount Chassis

PAM-ISA

Electrical and Environmental Specifications

CPU		
model		intel 80960KB with floating point unit
clock speed	MHz	25
Onboard Memory		
DRAM (for application execution)	Mbytes	{??}
Flash EPROM (for firmware & application storage)	Mbytes	2
non-volatile RAM (for parameter retention)	Kbytes	8
ISA Bus Interface		
specification version		Based on IEEE P996
memory operations		16 bit read/write operations
I/O port address		switch selectable
RS 232 Service Port		
baud rate	Baud	19,200
Input Power		
supply voltage	VDC	5.0 +/- 5 %
current	ADC	1.4 typ,
Environmental		
Operating temperature (without fan)	°C.	0 - 55
transport and storage temperature	°C.	-20 - +55
Relative humidity		10 - 90 % non-condensing
Fatal Error Output		
Switching capacity (resistive)		2 A / 24 VDC
Max. switching current	A	2.0
Max. switching voltage AC	VAC	50
Max. switching voltage DC	VDC	75

Table 3 PAM-ISA Specifications

Dimensions PAM-ISA

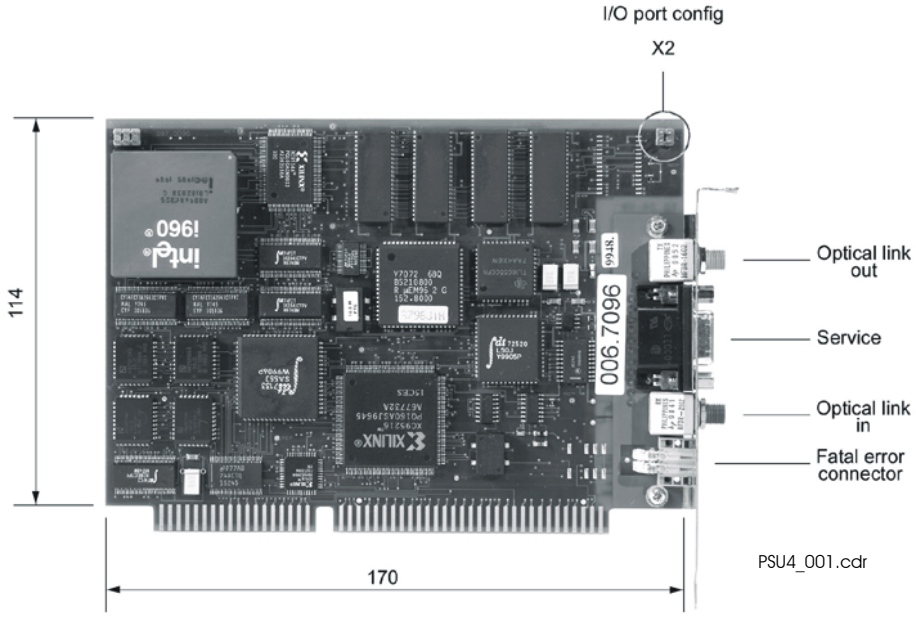

Figure 7 PAM-ISA Dimensions